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THE WESTERN SOCIETY OF NATURALISTS.[1]

BY S. A. FORBES.

THE first presidential address of a new society may well have for its subject the society itself; and the first duty of those responsible for such a society is to show its right to exist. There is only so much social power available for social purposes; why should we string a new belt to the already heavily burdened shaft, and tax the groaning engine with the movement of a new machine? Shall we interrupt and weaken the action of any existing agencies by this additional draft on the common stock of energy? or may we believe, on the contrary, that the final effect of our organization will be to increase the energy and activity of the whole apparatus; that it will react, in time, to supply power greater than that which it abstracts? In short, what are the objects and purposed uses of this Society of Western Naturalists? first, as to its own members; and second, as to society at large. These questions I shall endeavor to answer—not authoritatively—for only the Society can speak with authority for itself—but by way of interpretation and personal suggestion, hoping at least to raise questions concerning our scope, intention, and relations, which you may answer finally according to the common wish and judgment.

It seems proper, first, to say that in asking these questions, and in my attempts to answer them, I have in mind the present time, place, and conditions; that I shall not treat of the work which this Society might and should perform if it were established in Europe, or on the Atlantic seaboard, or if it were working in the twentieth century, but I shall inquire what are the ways in which we can most and best advance the study of our subjects in the present time and the immediate future, taking as our starting point the state of knowledge, the conditions of progress, and the special problems presenting themselves now in the northern half of the Mississippi valley.

And first, I remark, in phrase now temporarily classic, that "it is a condition and not a theory that confronts us." In the course of the development of science in this region, the easy things have in great part been done. The glittering sands have been largely passed through the cradle of the pioneer miner; the easily worked ores have been more or less thoroughly extracted, and we are fast approaching, if we have not already reached, the period when accumulated capital, powerful and complicated machinery, and the expert skill of the mining engineer are indispensable to the further development of our natural wealth. When a morning walk along the banks of the Wabash would give a Say new objects enough to keep him happily busy for weeks; when the moderately careful search of a single orchard or garden would yield to Fitch or Walsh, or the boyish Riley, material enough for an elaborate report; when the virgin soil of natural science only needed to be tickled with a hoe to laugh with a harvest, the question of methods and apparatus was one of quite subordinate importance. Little method and less machinery were needed to make a man useful and even eminent. And as for the educational problems with which we now have to deal, they gave the least imaginable concern, because they were practically non-existent. Until the movement for an industrial education based on science began, like a great ground swell, to heave the quiet surface, and until the tidal wave of popular interest and personal enthusiasm, set in motion by the elder Agassiz at Cambridge, swept across the West, the question of methods of instruction in natural history in school or college stood scarcely higher in the general estimation than that of the study of the language of the inhabitants of Mars. No one troubled himself about either. But since then, progress has been positive and really rapid, as those can best believe who have felt the full lift of the surge—has come with a speed accelerated, in fact, by the coincidence of three great movements.

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[1] Presidential address delivered at Champaign, Ill., October 24, 1888.

First, the onward movement of the natural sciences themselves—a growth which is the continual astonishment of every intelligent observer, and the despair of all but the ablest and most active students.

Second, the movement of growth and development in this interior region, relatively new, and newest of all in matters of science—this again a movement phenomenal in the history of the world.

And third, the progress resulting from the substitution of a younger and more highly educated working generation for an older one largely without special training.

From all this has come a recent change of status and surroundings, a modification of standards, a shifting of purposes and responsibilities, an accession of ideas, and a multiplication of duties, such as to compel us to consider the situation anew, and to urgently require a reorganization, along new lines, of whatever strength we can muster. In brief, the old machinery of scientific organization and development here in the West is much of it obsolete and inactive, and, taken as a whole, it is insufficient for the present day. The field of operation proposed by our Society—that of the improvement of methods of work, study, and instruction, is newly opened up to us by the rapid multiplication and complication of our subjects. The work we shall do is largely a new work, laid upon us as a condition of further symmetrical growth; and its performance is a duty which the promoters and curators of science and education in this region can avoid only at their own peril, and to the injury of the interests for which they have made themselves responsible.

If we look now to the benefits which we as individuals may hope to derive from our meetings, I count as most important some of those which are perhaps least obvious.

We are distinguished especially as a Society by an attention to methods rather than to results. That each worker should be deeply interested in whatever improvements of method are brought to light in his own field goes without saying, for in scientific research the method is, next to the man, the most important thing; the quality of the result depends on the choice of it, and the quantity upon that ready familiarity with it which makes every stroke tell to the best advantage; but if this were all, we should find ourselves splitting up into little sections of specialists, each indifferent to the other; or resolving ourselves, as an alternative, into a mutual toleration society, each group bearing patiently with the discussions of the others, that it might have the floor itself in turn. In fact, however, the methods of the different sciences are much more closely related than their results, and I am much mistaken if I, as a zoologist, shall not learn at least as much from the contributions to scientific method made by the botanists and geologists as from those in my own field. I may care little for the classification of the Ustilagineæ, but the methods by which that classification were worked out may be of the greatest use to me in entomology. I had occasion at one time to study minutely a purely biological problem—that of the food preferences of certain families of beetles, about which too little was known, but found that I could do nothing with it except by the methods of the insect anatomist, on the one hand, and of the microscopist on the other. I need to know about the contagious diseases of insects, as a matter of practicable and biological entomology, but find myself powerless to investigate them until I become expert in the methods of the baceriologist and the cryptogamist generally, and until I can make the nicest of histological preparations. I would like to learn the life histories of some phytophagous insects, but by the time I have worked them out I shall have made a close practical acquaintance with several of the methods of botany and horticulture. A new piece of apparatus in the hands of the mineralogist will suggest to the botanist a device solving a difficulty which has long blocked his way in some tempting line of investigation. I wish now that some chemist would tell me how to distinguish spherical pigment granules, by chemical means, from micrococci. That item of chemical method would break down a barrier against which I have bumped my head in vain for a year.

And if this is so with methods of research, much more is it true of methods of instruction. The geologist has to do primarily with rocks and fossils, the botanist with plants, and the zoologist with animals; but teachers of whatever subject all have to do primarily and chiefly with the human mind and the training of it, and teachers of whatever natural science have special ends in view with respect to the training of mind not very widely different. If I shall be profited by knowing how the geologist does his work, much more shall I be pleased to learn how he leads his classes; and it is to be hoped that the discussions of teaching methods to which our meetings should give rise will result finally in the common acknowedgment and established use by all of us of certain principles and methods, such that our work may have a uniform character, and its results a definite value, not wholly dependent on the point of view and the personal idiosyncrasy of the instructor.

While our community of interests, this overlapping and intermingling of methods, brings us into closer fellowship than if this were an academy of sciences merely, so the motive that induces us must give our meetings an air of cordiality, of mutual gratitude, and good will. He who reads me a paper embodying results of research—the finished product of his work—may do it for my benefit, or possibly for his own—it sometimes takes evidence to determine which; but he who takes me into his shop, and shows me just how and with what he works, exposes to me the skilled methods which have yielded the results I admire and emulate, does that for *me*, there is no doubt about it.

We may be sure that the contributors to our programmes will be governed by a generous wish to share with each other the most precious items of their knowledge, those on which they especially depend for their own professional success.

Then we shall profit greatly, beyond a doubt, by the knowledge gained of the state and progress of science and education in our midst, as we hold our successive meetings in the various centres of education and research throughout our territory; and thus we shall learn what is the best thing which we as a Society can do for science in this region, and in each part of this region, from year to year, and shall be prepared always to welcome intelligently, and readily to assimilate the new energies penetrating to our midst—avoiding, on the one hand, that attitude of selfish and obstinate conservatism, which, acting on the unprincipled motto, "After us the deluge," would sweep back the future with its burden of progress; and, on the other hand, rapidly, but genially, toning down the crude and intolerant egotism of the occasional brand new man, who thinks to himself, "Before me chaos." And so we shall hold, I hope, to the golden mean of vigorous and rapid, but continuous and harmonious, growth.

But the scientist is also a citizen, and all the more a citizen the more a scientist he is, if he knows his own interest and duty. His social responsibilities, like those of all other men, increase with his capacity, with his possible importance as a factor in the social scheme; and he has a special social interest due to the fact that the higher the grade of his work, the more important to him, the more nearly indispensable, indeed, is a high grade of social organization about him—a fine and intelligent spirit; for without these, the institutions, the enterprises, essential to his success can neither be established nor maintained. Each scientific society, if it is to live and thrive, must serve as a centre of upheaval for the community at large. If we unite and firmly bind ourselves in a society of restricted numbers, and with somewhat limited conditions of admission, this is not done with any unworthy purpose of discriminating in our own favor, or of confining to our membership the benefits of our association, but to give unity and distinctive character to our influence, that it may reach farther and go deeper than if the energy of our organization were to be chiefly spent in keeping ourselves alive.

And so we may inquire, what is to be our outside influence? I think that we may reasonably expect, acting within the limits of our organization, and along the line of our special purposes, to have a stimulating and directive influence upon the science work of the educational institutions and associations of this region, upon the local scientific societies with which we are connected, and, through our meetings and papers, upon the more intelligent part of the general public. While ours is not primarily an association of teachers, but of original workers in science, it so happens that most of us teach, and there is certainly no way in which we can advance science more effectively than by sending out classes of bright and ambitious pupils prepared for research. Discussions of the methods of this work must consequently always be in order; and besides this internal work and influence, I believe that we should lay down, advocate, and defend a few general principles—bearing, for example, on the relations of instruction and investigation, on the main ends of training in science, on the selection, arrangement, and co-ordination of subjects in each division of the courses in which we are especially interested; on the amount, kind, and time of introduction, of primary work in science preparatory to that of our higher institutions of learning, and the like. Preliminary, however, to any application of such principles to the actual situation in this region, we certainly and especially need to examine the situation itself, with respect to the institutions which we represent, to others not connected with us by membership of their instructors, and to the preparatory and high schools generally. I would greatly like to see a committee or committees raised which should report to us at our next meeting a well-digested exhibit of these matters. Nothing could be more useful to us, and nothing, I think, would bring our work more directly and favorably to the notice of our immediate public. And then, in the papers and discussions of our school and college associations, in our State and more local scientific societies and academies, we should bring to bear the ideas and principles established by discussion here, and so carry the work outward by concerted action, as by a movement in line.

To our semi-scientific and scientific associates outside this body, we should, of course, carry whatever new thing of applicable value our meetings give us possession of, and thus enlarge the circle of the Society's influence. In these and other ways I hope that we might do much to increase the number of intelligent local observers and earnest independent students—now far too few in this region—and thus help to create and sustain a scientific sentiment, in which the present and approaching generation certainly fall far short of that now going out of action. It is a suicidal blunder to discourage the amateur, to undervalue the mere collector of specimens and reporter of facts, to create the impression, either wilfully or unwittingly, that none but the very learned have anything to do with the promotion of science. We cannot hang the truncated apex of our pyramid to the stars, not even to those of the German heaven—and if we could, we should not, for, after all, science is for man, and not man for science. The general public, it might seem, can scarcely be interested—even the more intelligent part of it—in a conference of specialists respecting their methods of technical work, and yet I think that this view is not altogether correct. Whoever cares for the results of scientific inquiry must usually be curious, at least, concerning the methods by which those often surprising results are reached—and frequently the method is by far the more interesting and the more easily understood. While much of our discussion of details would be tedious, and many fragmentary contributions incomprehensible, we might, I think, at least prepare at each meeting one or more evening programmes for the general public, setting forth fully and systematically several of the more remarkable and interesting processes of the biological laboratory and the geological office; the pure culture of bacteria, the methods of minute measurement, and those of microphotography, the preparation of serial sections and the like—all to be used, perhaps, as illustrations of the general method of science at large. For, after all, the method of science, if the general public only knew it, is of greater importance to them than its matter. The method of science is simply the *sure* method, and the simplest and most economical consistent with certainty. Any other is either wasteful or unsafe. To know, to appreciate, to command this method, is to control resources beside which the mere knowledge of facts has but little significance.

It will be the most important public function of this Society to extend the knowledge and the use of the method of science, applied in the spirit of science, among the unscientific. The great mission of science is two-fold—to reveal the universe, and to rationalize the human mind. The first of these tasks, vast as it is, is still comparatively easy, for it is wrought out directly by the scientist himself applying the methods and apparatus of research to the facts of nature; but the second is immeasurably more difficult, because it can only be accomplished by a sort of a beneficent contagion affecting the spontaneous activities of the individual mind; by the persuasive influence of example, and a perceived superiority of results. To improve every occasion to expose, to commend, and to illustrate the scientific method, to encourage its application, to lead in its use in the common affairs of life and society—in business, in politics, in ethics, in whatever affects the welfare of man as a social being, is a duty to our kind, the importance of whose performance we shall never perhaps see more eloquently illustrated than by the occurrences of the present moment, when some of the greatest interests of one of the greatest nations of history are hanging on the decision of a purely scientific question by unscientific minds, worked upon by methods as little scientific as one can well imagine.

It thus seems certain, finally, that our young Society cannot languish for want of a field appropriate and peculiar to itself, for lack of a varied, greatly needed, and highly important work, beneficial to its members and to the general community—a work which nothing else is now attempting, and which, if we do not do it, seems likely to remain undone. The quality of our membership, the number and spirit of those in attendance on this, our first annual meeting, the valuable character of our programme, are all an earnest of growth and active labor. Let us all lend the promising youngster our warmest wishes for a vigorous and useful career, and join in the cheer, long life, and a busy one, to the Western Society of Naturalists.

SKETCHES OF THE CASCADE MOUNTAINS OF OREGON.

BY E. D. COPE.

THE Cascade Mountains of Oregon are destined to be the favorite resort of tourists who love all that is most beautiful, impressive and wild in mountain scenery. Lying over one of the greatest of the fractures of the earth's crust, they represent the remains of successive outflows of molten material at its source. The basis of the range is eruptive, and displays the irregularities of surface due to such origin within comparatively recent geological ages, and to the rapid erosion which naturally occurs in a humid climate. Thus gorges of great depth traverse its masses, and precipices of tremendous height bound many of its elevations. Beautiful lakes nestle in its depressions, and waterfalls leap from level to level on their way to the tributaries of the Columbia. All is clothed in sombre forest of conifers, of larger proportions or more elegant foliage than can be found in any other region. High above all these mountains tower at intervals along the range, the great snow-peaks which give the region its especial beauty. These are extinct volcanoes which raised themselves round vents which long remained open, and which poured out lava, scoriæ, pumice and ashes, after the great fissure was closed.

The great lava outflow from the Cascade Mountain fissure is one of the most extensive the world has ever seen, and was one of the most destructive in its consequences. There were several distinct periods of outflow, two being especially distinguishable in the stratigraphy of central Oregon. Between the outflows from this and from lesser sources to the eastward, a country of eight hundred